The mechanism of mobility degradation in MISFETs with Al_2O_3 gate dielectric

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We fabricated FETs with ALCVD-Al_2O_3 gate dielectric and examined the effect of surface treatment before Al_2O_3 deposition. Pre-nitridation is effective to reduce flat band shift and gate depletion. By optimizing the post-oxidation and controlling the interfacial oxide thickness, almost the same FET characteristics and electron mobility can be obtained regardless of surface treatment. We have shown that the main cause of mobility degradation is fixed-charge-induced Coulomb scattering and that phonon scattering has little effect.